November 30, 1857.

ANNIVERSARY MEETING.

The LORD WROTTESLEY, President, in the Chair.

Mr. Gassiot reported, on the part of the Auditors of the Treasurer's Accounts, that the total receipts during the past year, including proceeds of the sale of £1500 Consols and a balance of £47 9*s.* due to the Society's Banker, amount to £4841 18*s.* 4*d.*; and that the total expenditure during the same period amounts to £4814 12*s.* 8*d.*, leaving a balance in the hands of the Treasurer of £27 5*s.* 8*d.*

The thanks of the Society were voted to the Treasurer and Auditors.

The President announced that Sir Philip de Malpas Grey Egerton, Bart., had been re-elected by the Council a Trustee of the Soane Museum.

List of Fellows deceased since the last Anniversary.

On the Home List.

Henry James Brooke, Esq.
Sir Charles Mansfield Clarke, Bart., M.D.
Very Rev. William Daniel Conybeare, Dean of Llandaff.
Right Hon. John Wilson Croker, LL.D.
John Disney, Esq., LL.D.
The Earl Fitzwilliam.
Marshall Hall, M.D.
James Holman, Lieut. R.N.
James Horne, Esq.
Thomas Best Jervis, Col. R.E.
James Adey Ogle, M.D.
John Ayrton Paris, M.D.
Rev. William Scoresby, D.D.
Joseph Smith, Esq.
Richard Twining, Esq.
Andrew Ure, M.D.
William Wood, Esq.

On the Foreign List.

Augustin Louis Cauchy.
Le Baron Louis Thénard.

Withdrawn from the Society.

Sir William Burnett, M.D.

List of Fellows elected since the last Anniversary.

Lionel Smith Beale, Esq.
George Boole, Esq.
George Bowdler Buckton, Esq.
Thomas Davidson, Esq.
George Grote, Esq.
Rowland Hill, Esq.
The Rev. Thomas P. Kirkman.
William Marcet, M.D.
John Marshall, Esq.
Andrew Smith, M.D.
Robert Angus Smith, Esq.
Charles Piazzi Smyth, Esq.
Henry Clifton Sorby, Esq.
John Welsh, Esq.
Joseph Whitworth, Esq.

The President then addressed the Society as follows :—

GENTLEMEN,

IN considering what ought to form the subject of the Annual Address, it would naturally occur to any one, having the honour to hold the office of your President, that it might be desirable to mention in detail all the important discoveries and researches which had enriched the annals of science since the preceding anniversary ; and in addition, to describe any events which had occurred, or any specific measures which had been adopted, tending to improve the position of science or its cultivators. With respect however to the former, the range of subjects within the cognizance of this Society is so extensive, that the time ordinarily appropriated to the duty, in which I am now engaged, would be utterly inadequate to the purpose; and it is the less necessary, since it has become the annual custom of the Presidents or Councils of Scientific Associations, cultivating particular branches of science, to take a very extended view of the advance made in their own particular departments ; and in the case of the British Association especially, whose range of subjects is almost as extensive as our own, the Presidents of that Society have been in the habit of giving a very detailed statement of the progress of science during the past year. I may be permitted perhaps to refer for an example to the Address delivered at the last meeting of the British Association, as containing a most able and lucid statement of the kind to which I allude.

Under the other head to which reference has been made, one of the most important events has been the final adoption by your President and Council of the twelve resolutions, to which I took the liberty of referring on a former occasion. I then stated that we had taken

into consideration the important question, whether any measures could be adopted by the Government or Parliament that would improve the position of science in this country? and that, having elicited and duly weighed the opinions of all those most competent to give advice on the subject, we had finally adopted those resolutions and forwarded them to Lord Palmerston. This step was taken in the beginning of this year. The measures recommended by them relate, first, to education, and they are contained in Nos. 1 to 4 inclusive; secondly, there are others which have for their object the encouragement of scientific discovery and research, and these are Nos. 5 to 9 inclusive; and thirdly, Nos. 10 to 12 suggest measures, which, while they are calculated to confer great benefit on cultivators of science, are yet of still greater importance, when viewed in their bearings upon the interests of the nation at large. Although I shall have occasion to allude to some of the other recommendations, it is with respect only to the last-mentioned that I shall trouble you with any detailed observations.

Many here present will doubtless be able to recall to their recollection instances in which great mistakes have been committed for want either of access to competent scientific advice, or from reluctance to refer to it, when access was easy; but those who are familiar with the mode of conducting public affairs in this country, and at the same time duly appreciate the value of scientific research, are best able to estimate the extent of this evil; and to such persons it is distressing sometimes to witness the injudicious expenditure of large sums of money, while the same sums bestowed upon other and more generally beneficial objects, and under proper advice, might have been productive of very valuable results. But this is not all; for, side by side with this wasteful expenditure, we are compelled to witness the most rigid parsimony, where a little money timely bestowed upon the furtherance of some measure recommended by competent authority might have borne fruit a hundredfold.

Your President and Council have ventured to think, that, if the Government could be induced to consult some responsible body of scientific men, either one already existing, or to be specially constituted for that purpose, some of these evils, so far as they affect science at least, might be averted; and happy indeed would it be for those researches and investigations in which we all take so deep an

interest, if a small part only of the money thus saved to the nation should be expended on their promotion; and happy would it be for the nation, if such a check were provided against the improvident waste of the hardly-earned produce of its own industry.

The natural tendency of men is to undervalue what they cannot understand, and thus the abstruse speculations of the geometrician, and the recondite researches of the physicist, the object of which even is unintelligible to the many, are deemed of no value when weighed in the balance of public opinion against the splendid inventions which, after a long series of years, emanate from their labours. Often, when those who have scattered the precious seed are dead and forgotten, and their families are perhaps pining in penury, and calling in vain on an ungrateful country for a petty dole from the public purse, does the glorious harvest ripen, which they have sown. For this cause among many others, the opportunity of taking the opinions of such a Body, or such a Board, would be of the last importance to the best interests of society, for their approval would be a guarantee to the public of the expediency of any measure which they might recommend. It is impossible of course to suggest any innovation from which those who make the proposal could by possibility derive advantage, direct or indirect, without subjecting them to the charge of doing so from interested motives ;—and yet a distinguished Member of the Government Grant Committee, from which these resolutions emanated, said early in the course of their discussion, "Let us ask for nothing for ourselves," and in this spirit were the resolutions framed. The chief object aimed at, was the encouragement of young men, competent to the task, who, with insufficient means at their command, were just entering upon a hopeful career of scientific research. You will therefore look in vain for any recommendations to bestow titles, medals, or other honours upon men whose scientific labours have long been before the world. But no amendment in our institutions could ever be carried out, if men were to be deterred by such considerations as I have adverted to, from fearlessly advocating that which in their conscience they believe to be fraught with advantage. Since the resolutions were transmitted to the Government, they have been moved for, laid on the table of both Houses of Parliament, and printed; whatever further steps may be taken to urge their adoption, I do not think that it would be right that this Society,

or its officers, as such, should take any part in them. It is enough that your Council have expressed their opinion; they must leave the result to time.

Since the last Anniversary we have been installed in the occupation of the building in which we are now assembled, and all the arrangements for our reception have been completed, except the painting of the Great Hall, which has been delayed by the dampness of the walls; nor have the requisite seats been yet supplied. I trust that the furniture of the rooms and the arrangement of the library in the main building have given satisfaction. I think credit is due to Mr. Weld our Assistant Secretary, and also to Mr. White, for the care and attention they have displayed in carrying into effect all our instructions.

It would appear from the Address of the noble Earl the President of the Society of Antiquaries, that some of that distinguished body are disposed to think we did not much regret the severance of the connexion which had so long and happily subsisted between the two Societies. Speaking for myself, and I have no doubt for many other members of the Royal Society, I may say that I should greatly rejoice, if by the liberality of Her Majesty's Government that ancient Society again found an abode in our own immediate neighbourhood—not however to the exclusion of any Scientific Society that had just claims to similar accommodation.

Several applications have been made to your President and Council requesting permission to use the Great Hall for various purposes. On the part of the Government it has been applied for, for the purpose of holding Competitive Examinations for admission into the Royal Academy of Woolwich, and likewise for the Examinations of Candidates for Commissions in the Army. These applications on the part of the War Department have always been framed with a courteous regard to our convenience, and they have been acceded to. Your Council were of opinion that the object sought to be obtained was one of great public importance, and that under the circumstances they should not be justified in withholding their consent. At the same time it must be admitted that frequent demands of this description might be productive of inconvenience, especially in reference to the access to the lower library. An application was also made by the Royal Geographical Society for the use of the Hall during

the ensuing session, and this request has also been willingly complied with. That Society meets but once a fortnight, and on a day which does not interfere with our own meetings. Nor can there be any difference of opinion as to the value of their labours in the promotion of science, if prosecuted, as there is every reason to hope they will be, with a special view to that object. Indeed there are few associations that might render more important aid in this behalf, than a Society instituted for the purpose of originating, organizing, and supporting extensive explorations of such portions of the earth's surface as have not hitherto been surveyed at all, or have been imperfectly examined. But in order that the operations of such a Society should be productive of all the benefit of which they are capable, care should be taken that no expedition be allowed to leave our shores without being supplied with proper instruments, and accompanied by those who are competent to make such scientific observations as the nature of the case will admit of; and lastly, provision should be made for the proper reduction and publication of such observations, so that the results may be rendered as extensively useful as possible.

On the occasion of sending out Lady Franklin's last expedition, every exertion was made by us to supply its able commander, Capt. M'Clintock, with a complete set of instruments, properly constructed and carefully compared, and with observers trained in their use. As to the former we were quite successful; but as to the latter, difficulties arose in reference to the employment of a particular officer, whose services the Admiralty were unwilling to dispense with. I am happy to be able to announce to you that I have had the pleasure of perusing a letter from Capt. M'Clintock, dated from the west coast of Greenland, expressing entire confidence in his brave companions and in his ship, and hopeful anticipations as to the future. Need I say more than that it was a letter written in the true spirit of a British Naval Officer, embarked in a momentous enterprise, conscious that many eyes and many hearts were anxiously tracking his steps over the icebound watery waste, and determined to put forth all his energies to achieve success in a noble cause.

That any one should entertain any doubt of the propriety of extending to the utmost our acquaintance with the globe we inhabit, seems extraordinary. That men should be found to undervalue the results of scientific research is not surprising, but that they should

overlook the other manifold blessings which accrue to mankind from successful undertakings of this description, could not be for a moment believed, if we had not evidence that persons do really exist, who look with indifference at such triumphs of human enterprise; men who might have joined in the outcry against Columbus, and have deprecated the expeditions of Dampier, Flinders, Cook, Parry and others. Had a majority of the so-called educated portion of mankind consisted of such men, we should perhaps now be without America and Australia, the human mind would have been miserably stunted in its growth, and civilization impeded in its progress. Such views are not likely to obtain much support at the present time; we may rest assured, for example, that Government will entertain with favour the proposal for exploring the river Zambesi, which has been suggested by the travels of that most persevering benefactor of mankind, the enterprising and distinguished Livingstone.

Though, as I have already said, it would be impossible to specify all the facts of interest which have been lately observed in the arena of physical research, there are some recent discoveries in magnetism which I should be unwilling to pass over in silence.

All who have attended to magnetical phenomena, are aware, that among the results of magnetic observations, and especially that extensive system of research, which was organized a few years ago at the earnest request of the illustrious traveller Humboldt, is to be reckoned the correct knowledge which we now possess of the regular periodical changes of the magnetic elements, depending on the hour of the day, the season of the year, and also on a period, somewhat exceeding ten of our years, which, when first discovered, appeared to have no analogue in any other known periodical phenomenon.

Besides these regular periodical effects, there are changes which occur suddenly at irregular intervals, and simultaneously in the most distant parts of the earth—

> ". . . . . though the main
> Roll its broad surge betwixt, and different stars
> Behold their wakeful motions,"

to use the words of a poet and a Fellow of the Royal Society, who, writing at a very early age, and above a hundred years ago, seems by an extraordinary accident to have described by anticipation one of

the most remarkable magnetic phenomena revealed to us by modern discoveries.

Now these sudden changes are characterized by very large deviations from the normal state. They are termed "Magnetic Storms." It is found, however, that these storms occur more frequently at certain hours of the day than at others, and are therefore themselves subject to periodical laws. These laws have been worked out by our able and persevering Treasurer, who has devoted, and with such distinguished success, so much of his valuable time to this species of research, and he finds that even these storms observe diurnal, annual, and decennial periods.

Several who are now present are aware how many years of laborious toil have been expended in procuring these striking results. In various places of our colonies and dependencies, at St. Helena, at Toronto, at Hobarton, for example, officers and non-commissioned officers of the Artillery, and officers of the Royal Navy were engaged hourly through the day and night in watching the vibrations and angles of small magnetic needles delicately suspended; a class of observations of a very tedious and exhausting description, and requiring great patience, perseverance and accuracy. Still, undeterred by all these difficulties, and often doubtless at great personal sacrifice, these true votaries of science continued their anxious vigils. As the observations were received by General Sabine, they were carefully reduced and coordinated at an establishment organized by him at Woolwich for that purpose.

But while this was proceeding, there was, unknown to our magnetic observers, another persevering enthusiast at work, whose labours were destined to have an important relation to theirs.

We must transport ourselves, in imagination, to the upper chamber of a modest dwelling in an obscure town in Germany, in which an old man has day by day for thirty long weary years been in the habit of observing the sun through two small telescopes, placed in a window overlooking the roofs of the houses. Every day, when the luminary was visible, did this persevering observer, Schwabe by name, survey its face, and note down the appearances of its disk. In this way he obtained a faithful record of the configuration of the spots during the whole of this long period. Science presents few examples of such unwearied concentration of attention on one object. Often,

no doubt, the friends, and perhaps the relatives of the observer, have presumed to ridicule his devotion to what seemed to them a trivial pursuit; but the result of all this labour was the discovery of what had escaped the attention of all astronomers for two hundred years, at least had been before only very faintly suspected, viz. that the spots on the sun's disk pass through the phases of maximum and minimum frequency in a period of about ten years. But, strange to say, it was then discovered, and first announced in our Transactions by General Sabine the discoverer, that the decennial *magnetic* period coincides, both in its duration and in its epochs of maximum and minimum, with the decennial period observed by Schwabe in the solar spots; that is, the period of maximum variation with that of the maximum frequency of spots, and so *vice versâ* the minimum. Hence it is clear that the sun exercises some influence on the earth's magnetism dependent on the existing state of its own luminous atmosphere. Surely this is another remarkable instance that fact is often more strange than fiction. How little could the secluded observer, watching the quiverings of the needle in the remote regions of Australia, or on the shores of the Polar Sea, dream either that his labours would derive additional interest from the unconscious cooperation of a German astronomer, or that he was himself engaged in watching vibrations which were oscillating in harmony with the motions of a gaseous substance ninety-five millions of miles away! This is again another example added to the many other illustrations of the same truth, that scientific researches, if skilfully and perseveringly continued, often lead to most valuable results, which could not have been anticipated *à priori*; and this should surely be as great an incentive to toil as it is a glorious reward of discovery.

But this is not all: it has been found also that our less obtrusive satellite, that the mild influence of the moon affects the magnetic needle; the declination, the inclination, and the magnetic force, all undergo a small variation, dependent on the lunar hour angle. A delicately suspended magnet is truly the most submissive of all slaves, affected by the sun, and the moon, and the earth, and the sport of every electric or magnetic current that approaches it.

"Whate'er the line
Which one possessed, nor pause nor quiet knew
The sure associate, ere, with trembling speed,
He found its path, and fixed unerring there."

Before leaving the subject of magnetism, I would mention another result lately obtained in that department of science, which we owe to one of those voyages to the Arctic Seas, which some are wont to describe as useless to mankind, and a foolish exposure of human life.

Capt. Maguire commanded the Plover, one of the ships employed in the Franklin search in the years 1852–3–4, and he was stationed from the summer of 1852 to that of 1854 at Point Barrow, the most northern cape of the American Continent, between Behring's Strait and the Mackenzie River. During every hour of seventeen months unremittingly did Capt. Maguire and his officers observe and record the variations of the magnetic declination and the concomitant auroral phenomena, in an observatory built of ice and lined with seal-skins; in a most dreary and unenviable locality indeed, but still one of the most favourable for such investigations. The observations, as usual, were reduced under the direction of our Treasurer, and they reveal this important fact:—On comparing them with those made at Toronto, it was found, that although the deflections of the same name at the two stations did not correspond, there existed, on the other hand, a very striking and remarkable correspondence between the easterly disturbances at Point Barrow and the westerly at Toronto, and *vice versâ*. In the case of the regular solar-diurnal variation, the easterly and westerly extremes are reached at both stations at nearly the same hours; but in the case of the abnormal diurnal variation, the progression is reversed, the easterly extreme at the one coinciding very nearly with the westerly at the other. The absolute disturbing force appears to be much greater at Point Barrow than at Toronto, and in correspondence therewith is the frequency of the auroral manifestations. During the six months of darkness in the two successive winters, out of 3625 hourly observations, there were 1077, or 30 per cent., at which the aurora was visible. It appeared, also, that 1 A.M. was the hour at which aurora most frequently appeared, and that between 11 A.M. and 3 P.M. is the period of minimum frequency.

The above interesting results have suggested to the British Association the importance of instituting magnetic observations for another winter or two at some point, so situated between the above-mentioned two stations, as to render it a proper locality for ascertaining the laws on which the remarkable and characteristic analogies

and differences in the results derived from each depend. There is no place better fitted for this purpose than the mouth of Mackenzie's River. I cannot but express my earnest desire that Her Majesty's Government will also consent to send out one vessel for *this* purpose, as it will be attended with little or no risk, and a most important scientific object will be attained. Moreover, it will be a great satisfaction to the friends of Capt. M'Clintock and his gallant crew to know that there is a vessel stationed at such a spot, should any unlooked-for misfortune befall an expedition, which, thanks to the devotion of a bereaved widow to her heroic husband, has cost the country nothing but the expenditure of a few hitherto unemployed stores.

The Meteorological Department of the Board of Trade, under the able superintendence of Admiral FitzRoy, bids fair to realize all the hopeful anticipations which were formed of the beneficial effects which such an institution was calculated to produce in improving Navigation and the science of Meteorology. Agents have now been established at the principal ports for the supply of instruments properly verified, books and instructions. More than two hundred ships have been so supplied, and more than one hundred logs have been forwarded, which are in process of coordination and reduction. Valuable materials are thus continually accumulating, and to such a degree, that the only difficulties of the Office arise from the overwhelming extent of the communications which are daily pouring in,—overwhelming, that is to say, when viewed in reference to the Staff available for reducing them.

Meanwhile other Governments have not been slow to avail themselves of the advantages to be derived from Lieut. Maury's Sailing Directions and Charts, and the measures which he recommends. The Officer at the head of the Meteorological Department of the Dutch Marine states, that by their means the voyages to Batavia have been shortened one-eighth. An Officer of the French Navy is also engaged in condensing and translating Maury's works for the use of the French Marine; and a French Department of Oceanic Meteorology is about to be formed. Other nations have followed in the same track, and, on the whole, voyages have been already reduced to from a tenth to a quarter of their former periods; a result to be attributed in part doubtless to the improvement in ship-

building, to which art Science has lately rendered important aid, but principally to the cause in question.

A portion of the success of this Meteorological Department of the Board of Trade is certainly due to the facilities afforded by that admirable institution, the Observatory at Kew, for the verification of the instruments supplied. I have already had occasion to acknowledge the obligations which Science is under to the same establishment for supplying magnetic and meteorological instruments, duly verified, to various scientific expeditions sent out both by this and other countries. Our debt of gratitude to this Observatory and its able Superintendent, Mr. Welsh, is likely to be shortly still further augmented by valuable improvements in the photographic record of various phenomena, and among others, of the spots on the sun's disk; for the observation of which a telescope, by Ross, has been lately erected. Surely it is a cause of great congratulation that, by means of the fund, the income of which was placed at their disposal by the liberality of Dr. Wollaston and others, your Council were able to render essential aid, and at the time of its greatest need, to an Institution whose efficient maintenance has become a European necessity,

In taking a general view of the proceedings of the Institutions, both in this and other countries, whose common object may be said to be the increase of the happiness of our species, though by various and widely different methods, one cannot but be struck, first by the great number of such establishments and the inadequacy of the results obtained, if considered in reference to the means provided; and, secondly, by the fact, that in the same country and at the same time many different bodies are at work in striving to produce the same end; but, instead of combining their forces, they often interfere with each other's operations; instead of helping one another, they are perhaps even disposed sometimes to view with jealousy the success of their rivals. Thus, to take an instance, let us consider how many different bodies of men, official or otherwise, are now employed in attempting, but hitherto with little success, to diffuse more widely among the inhabitants of this favoured island the blessings of education, including a knowledge of the elements of the physical sciences. Let us reflect for a moment what might be the result of so many different currents of intellectual force,

if, instead of crossing and jostling one another in various directions, they were to be forced to flow in one harmonious channel. Surely, when so much is at stake, and the prize to be obtained is human happiness, some attempt at combination might be made, some effort to bring together a portion of the divergent elements. The Scientific Board, above suggested, might do some good; Government or Parliament might do more; but it is to social progress and the general improvement of our species, that we must look for the complete realization of the hopes which every good man is sometimes led to form of a happy future in store for his race; and obliged, as we are, in our course through life, to witness so much that we have great cause to regret, and scarcely any power to mend, this reflection is perhaps one of our brightest and purest consolations.

The Copley Medal has been awarded to M. Chevreul for his important investigations in Organic Chemistry, particularly for his researches upon the nature and composition of the fats and fixed oils, and for his physical investigations on the processes of dyeing, including those on the simultaneous contrast of colours.

Previous to the researches of M. Chevreul upon the fats, it was supposed that saponaceous compounds were combinations of the alkalies, and of oxide of lead with oils and fats; and, with the exception of Scheele's discovery, that glycerine was set free during the process of saponification, no precise chemical knowledge upon this subject existed.

The attention of M. Chevreul appears to have been directed to this matter by his observation that, on diluting a solution of a particular soap largely with water, a crystalline substance was separated in pearly scales; upon examining the nature of this crystalline compound he found it to consist of a combination of alkali with a peculiar fatty body of distinctly acid character. Starting from this point, he was induced to examine the subject of saponification *in extenso*; the result of his inquiries was the discovery of a large number of new compounds, and a masterly elucidation of the chemical history of the fixed oils, fats, soaps, and plasters.

M. Chevreul showed that ordinary fats and fixed oils consisted

mainly of three distinct compounds united in very various proportions. One of these compounds, *oleine*, is liquid at ordinary temperatures, the other two, *margarine* and *stearine*, are solid ; and, according as the liquid or solid constituents preponderate, the body assumes the consistence of oil, or of a fat less or more hard. He also showed that each of these three principles contains a distinct fatty acid united with the basis of glycerine, the sweet principle of oils ; that, when the fat or oil is acted on by alkalies or other metallic oxides, the basis of the glycerine is displaced, combining with water at the moment of its separation, thus forming true glycerine. The fatty or oily acid in the meantime unites with the alkali or metallic oxide : when the alkalies are used to effect the saponification, soluble soaps are found ; when metallic oxides, such as oxide of zinc, or oxide of lead, are employed as the saponifying agents, a plaster, or insoluble metallic soap, is formed.

But the discoveries of M. Chevreul were of far higher value in a scientific point of view than the mere establishment of facts, or the discovery of new bodies of importance in the arts. The methods of research which he introduced, laid the foundation of future inquiries, and may be said to have enabled Organic Chemistry to become what it now is.

At the time when the researches of M. Chevreul were commenced, no trustworthy process of ultimate organic analysis existed. A method capable of furnishing results, which, for accuracy, though not for rapidity and facility of execution, challenges comparison with those at present in use, was by him devised and applied. But a still more important aid to these inquiries was supplied. M. Chevreul was the first to perceive that the numerical results obtained by ultimate analysis of an organic compound were not the only data necessary to fix its true composition, and he first pointed out the importance of an extended study of the changes produced in each compound by the action of reagents.

The merit of recognizing and systematically introducing this leading principle into the methods of research practised in Organic Chemistry is due to M. Chevreul ; and the important services which he has thus rendered to the progress of Organic Chemistry are felt more and more in each succeeding year. Like other great men, M. Chevreul was in advance of his age, and a few years elapsed

before his contemporaries justly estimated and began to apply the principles which he had introduced.

But there is another side from which these researches must be viewed. Few investigations in Organic Chemistry have been fraught with more important consequences to the industrial arts than these which we are now considering. New methods of obtaining hard and valuable fats from oils of low price have been introduced, and the method of manufacture adopted for the better descriptions of candles has been entirely altered. A new branch of industry has indeed been created by these researches, since it is to them that we owe the introduction of what are known as stearine or composite candles.

The second important subject with which the name of M. Chevreul is permanently connected, is that of the contrast of Colours. His investigation upon this subject has, like his earlier one upon the fats, been regarded by all subsequent inquirers as the classical work upon the series of phenomena to which it relates. In duly appreciating the importance of these inquiries, it is necessary to consider both their purely scientific value and their direct practical bearing upon the art of the silk-dyer and the calico-printer, to whom they have afforded invaluable assistance, by the establishment of fixed rules to guide them in the selection of suitable and harmoniously contrasted tints, upon which so much of the beauty of their different fabrics depends.

Professor Miller,

Transmit this Medal to M. Chevreul, as the best proof which we can give of the value which we attach to his discoveries ; and express to him the gratification with which we have learnt that he is still engaged in the prosecution of scientific labours ; and our hope that his life will be prolonged to enable him to continue them, and enjoy the honour he has so deservedly obtained.

One of the Royal Medals has been awarded to Dr. Frankland.

In the year 1846, the question of the constitution of the alcohols and certain allied organic bodies excited the deepest attention among chemists. Dr. Kolbe had succeeded, by a most ingenious electrolytic process, in isolating the hitherto hypothetical radicals, valyl and methyl ; but the indirect nature of the reactions, by which these radi-

cals were separated from valerianic and acetic acid, failed to convince a large number of contemporary chemists, who had contended for some years against the existence of such radicals. Early in 1848, Dr. Frankland commenced his attempts to isolate these bodies by direct and unexceptionable reactions. Taking the isolation of the elementary radical, hydrogen, by the action of zinc upon hydriodic acid, as his type, he succeeded, in the laboratory of Professor Bunsen at Marburg, in isolating from their iodides the compound radicals methyl, ethyl, and amyl; thus establishing the complete homology of these substances with hydrogen.

The subsequent prosecution of these researches also led Dr. Frankland to the discovery of a new series of remarkable organic compounds, containing the metals zinc, tin, and mercury, united with the radicals before mentioned. These metals had not been previously known to enter into combinations of that class. The compounds of zinc with methyl and ethyl have, moreover, proved most valuable bodies in the hands of Frankland, Hofmann, and others, for effecting substitutions which had previously been impracticable.

The laborious and masterly researches of Bunsen on cacodyl had rendered this most remarkable substance an object of the highest interest to chemists; nevertheless, its isolated position, and the complicated reactions attending its formation, stood in the way of any satisfactory conclusion as to its rational constitution. The study of the organo-metallic bodies containing zinc, tin, and mercury, and of those discovered by Löwig and others, led Dr. Frankland to a generalization, which grouped cacodyl and the rest of those organo-metallic compounds into a harmonious family, and according to which these substances are formed upon the types of the inorganic compounds of the respective metals with oxygen, sulphur, and other similar bodies.

In the hands of Dr. Frankland, this theory has already borne fruit. Guided by it, he has succeeded in replacing the oxygen of binoxide of nitrogen, by ethyl and methyl, thus obtaining two members of a new series of acids; while the formation, by one of his pupils, of two new organic derivations from sulphurous acid, is another result of the same important generalization.

Dr. Frankland,

Accept this Medal as the appropriate reward of researches, which have excited the greatest interest among all those who cultivate or appreciate the science which you have so materially advanced and adorned.

The other Royal Medal has been awarded to Dr. Lindley, in recognition of the value of his labours in various branches of Scientific Botany; and more especially for his learned and comprehensive works on the Natural Orders of Plants, on Orchideæ, and on theoretical and practical Horticulture.

The eminent position which Dr. Lindley has attained amongst naturalists, is founded upon a knowledge of the Vegetable Kingdom, in the most extended sense of that term, such as few have acquired; the result of many years of diligent research and continued study of the structure, morphology, and development of plants from every part of the globe. To the knowledge thus obtained, he has applied the resources of an original and vigorous intellect, and a quick appreciation of affinities; and he has embodied the results of his labours in a series of works upon the affinities of plants, which are alike remarkable for the clearness of their arrangement, the lucidity of their style, and the influence they have had upon the progress of philosophical Botany. In these labours we recognize with satisfaction the evidence of his regarding systematic Botany in its true light, as the sister science of the Comparative Anatomy of animals; and, like it, depending for the value of its results upon the number and variety, as well as the completeness and accuracy of the naturalist's observations, and upon his powers of combination.

In the systematic investigation of the Orchideous plants, Dr. Lindley has devoted himself during a long series of years to one of the most difficult branches of Descriptive Botany. The species of this remarkable and extensive natural order are of a singularly complicated structure—the clue to their affinities lies in minute organs; and as by far the greater number of species are only to be obtained for study in a dried and mutilated state, their investigation demands an amount of patience and skill in microscopic analysis, such as very few botanists have devoted to similar inquiries.

In the science of Horticulture Dr. Lindley has also taken the highest position; nor is it too much to say, that it is mainly due to his efforts that this branch of knowledge has risen from the condition of an empirical art to that of a developed science. In no department have his labours been more widely appreciated than in this; not only because, up to a very recent period, the ignorance of sound principles and the prevalence of injudicious practice retarded the progress of scientific horticulture, but because these evils could only be remedied by one combining that knowledge of scientific Botany and of gardening operations which he possesses. To these requirements he has added the power of studying the results of experimental research by means of those laws of climate in its relations to horticulture, which had previously been so ably expounded by our late illustrious Fellow, Professor Daniell. In pursuing these inquiries, Dr. Lindley has displayed the same ready facility in applying his varied knowledge to the investigation of difficult problems, which characterizes his works on the affinities of plants.

I may also briefly allude to Dr. Lindley's numerous elementary and other treatises on Botany, and on its applications to Medicine and the Arts; to the long series of illustrated works he has published; to his researches in the Fossil Flora of Great Britain; and to the cordial reception of so many of his writings on the Continent, as is evidenced by the translation of several of them into other European languages. In this award, the Council of the Royal Society further wish to mark their recognition of the great and beneficial influence of Dr. Lindley's labours, both as an author and Professor, in introducing and diffusing a knowledge of the natural system of Botany, and of Vegetable Anatomy and Physiology, into the Schools and Universities of this country.

DR. LINDLEY,

Accept this Medal in token of our appreciation of the labours of a whole life devoted to the successful cultivation and the extension of our knowledge of the sciences of Botany, Vegetable Physiology, and Horticulture.